CLAIMS

1. An optical disc recording apparatus for generating a modulation signal having a signal level switched at a period which is an integral multiple of a basic period in accordance with main information and controlling an optical beam applied to an optical disc based on said modulation signal to successively form, on said optical disc, pits and lands or marks and spaces having lengths which are represented by integral multiples of a basic length corresponding to said basic period, wherein a sequence of data based on auxiliary information is modulated by a signal represented by a combination of a sequence of pseudo-random numbers and a predetermined periodic signal, and recorded traces of said pits or said marks are changed depending on the modulated sequence of data, thereby recording said auxiliary information on said optical disc.

2. The optical disc recording apparatus according to claim 1, comprising:

a first modulation signal generating unit for generating a first modulation signal having a signal level switched at a period which is an integral multiple of the basic period in accordance with said main information;

a second modulation signal generating unit for modulating said first modulation signal with a signal based on the sequence of data based on said auxiliary information;

a recording beam modulating unit for modulating said optical beam with a signal output from said second modulation signal generating unit; and

an optical system for applying said optical beam to said optical disc;

said second modulation signal generating unit comprising:

a pseudo-random number generating unit for generating a pseudo-random number;

a periodic signal generating unit for generating said predetermined periodic signal;

an auxiliary information modulating unit for modulating the sequence of data based on said auxiliary information with a signal represented by a combination of the random number from said pseudo-random number generating unit and the predetermined periodic signal from said periodic signal generating unit; and

a modulation signal processing unit for modulating said first modulation signal to slightly change the recorded traces of said pits or said marks,

based on the modulated sequence of data from said auxiliary information modulating unit.

3. The optical disc recording apparatus according to claim 1, wherein said periodic signal comprises a signal inverted at a period which is at least twice said basic period.

4. The optical disc recording apparatus according to claim 2, wherein said periodic signal generating unit comprises a counter.

5. The optical disc recording apparatus according to claim 2, wherein said periodic signal generating unit comprises a unit for combining a plurality of signals inverted at a period which is at least twice said basic period to generate said periodic signal.

6. The optical disc recording apparatus according to claim 2, wherein said pseudo-random number generating unit comprises a linear feedback shift register.

7. The optical disc recording apparatus according to claim 1, wherein said recorded traces of said pits or said marks are changed at a position corresponding to a period extending substantially equally over a time corresponding to the center of said pits or said marks.

8. The optical disc recording apparatus according to claim 1, wherein said sequence of data based on said

auxiliary information comprises a sequence of identification data for identifying said optical disc.

9. The optical disc recording apparatus according to claim 1, wherein said main information is encrypted and recorded on said optical disc, and said sequence of data based on said auxiliary information comprises a sequence of data required to decrypt the encrypted main information.

10. The optical disc recording apparatus according to claim 1, wherein said recorded traces of said pits or said marks which have lengths equal to or greater than a predetermined length are changed by changing a width of said pits or said marks at a time which is spaced a predetermined interval from a time corresponding to an edge of said pits or said marks.

11. The optical disc recording apparatus according to claim 1, wherein said recorded traces of said pits or said marks are changed by displacing a position where said optical beam is applied to said optical disc in a radial direction of said optical disc, depending on the sequence of data based on said auxiliary information which is modulated by the signal represented by the combination of the sequence of pseudo-random numbers and the predetermined periodic signal.

12. The optical disc recording apparatus according to claim 1, wherein said recorded traces of said pits or said marks are changed by changing a length of said pits or said marks, depending on the sequence of data based on said auxiliary information which is modulated by the signal represented by the combination of the sequence of pseudo-random numbers and the predetermined periodic signal.

13. An optical disc recording apparatus for generating a modulation signal having a signal level switched at a period which is an integral multiple of a basic period in accordance with main information and controlling an optical beam applied to an optical disc based on said modulation signal to successively form, on said optical disc, pits and lands or marks and spaces having lengths which are represented by integral multiples of a basic length corresponding to said basic period, wherein a sequence of data based on auxiliary information is modulated by a signal represented by a combination of a sequence of pseudo-random numbers and a predetermined periodic signal, and the reflectance of an information recording surface of said optical disc is locally changed depending on the modulated sequence of data, thereby recording said auxiliary information on

said optical disc.

14. A method of recording information on an optical disc by successively forming, on said optical disc, pits and lands or marks and spaces having lengths which are represented by integral multiples of a predetermined basic length to record main information on said optical disc, comprising the steps of:

modulating a sequence of data based on auxiliary information with a signal represented by a combination of a sequence of pseudo-random numbers and a predetermined periodic signal; and

changing recorded traces of said pits or said marks depending on the modulated sequence of data, thereby recording said auxiliary information on said optical disc.

15. The method according to claim 14, wherein said recorded traces of said pits or said marks which have lengths equal to or greater than a predetermined length are changed by changing a width of said pits or said marks at a time which is spaced a predetermined interval from a time corresponding to an edge of said pits or said marks.

16. The method according to claim 14, wherein said recorded traces of said pits or said marks are changed by displacing a position where said optical beam is applied

to said optical disc in a radial direction of said optical disc, depending on the sequence of data based on said auxiliary information which is modulated by the signal represented by the combination of the sequence of pseudo-random numbers and the predetermined periodic signal.

17. The method according to claim 14, wherein said recorded traces of said pits or said marks are changed by changing a length of said pits or said marks, depending on the sequence of data based on said auxiliary information which is modulated by the signal represented by the combination of the sequence of pseudo-random numbers and the predetermined periodic signal.

18. A method of recording information on an optical disc by generating a modulation signal having a signal level switched at a period which is an integral multiple of a basic period in accordance with main information and controlling an optical beam applied to an optical disc based on said modulation signal to successively form, on said optical disc, pits and lands or marks and spaces having lengths which are represented by integral multiples of a basic length corresponding to said basic period, said method comprising the steps of:

modulating a sequence of data based on auxiliary

information with a signal represented by a combination of a sequence of pseudo-random numbers and a predetermined periodic signal; and

locally changing the reflectance of an information recording surface of said optical disc depending on the modulated sequence of data, thereby recording said auxiliary information on said optical disc.

19. An optical disc having pits and lands or marks and spaces having lengths which are represented by integral multiples of a predetermined basic length, successively formed to record main information on said optical disc, wherein a sequence of data based on auxiliary information is modulated by a signal represented by a combination of a sequence of pseudo-random numbers and a predetermined periodic signal, and recorded traces of said pits or said marks are changed depending on the modulated sequence of data, thereby recording said auxiliary information on said optical disc.

20. The optical disc according to claim 19, wherein said recorded traces of said pits or said marks which have lengths equal to or greater than a predetermined length are changed by changing a width of said pits or said marks at a time which is spaced a predetermined interval from a time corresponding to an edge of said

pits or said marks.

21. The optical disc according to claim 20, wherein said recorded traces of said pits or said marks are changed at a position corresponding to a period extending substantially equally over a time corresponding to the center of said pits or said marks.

22. The optical disc according to claim 20, wherein the width of said pits or said marks is changed depending on the modulated sequence of data by at most 10% of an average width of said pits or said marks.

23. The optical disc according to claim 19, wherein the sequence of data based on said auxiliary information comprises a sequence of identification data for identifying said optical disc.

24. The optical disc according to claim 19, wherein said main information is encrypted and recorded on said optical disc, and said sequence of data based on said auxiliary information comprises a sequence of data required to decrypt the encrypted main information.

25. The optical disc according to claim 19, wherein said pits or said marks have a position displaced in a radial direction of said optical disc depending on the sequence of data based on said auxiliary information which is modulated by the signal represented by the

combination of the sequence of pseudo-random numbers and the predetermined periodic signal.

26. The optical disc according to claim 19, wherein said pits or said marks have a length displaced depending on the sequence of data based on said auxiliary information which is modulated by the signal represented by the combination of the sequence of pseudo-random numbers and the predetermined periodic signal.

27. An optical disc having pits and lands or marks and spaces having lengths which are represented by integral multiples of a predetermined basic length, successively formed to record main information on said optical disc, wherein a sequence of data based on auxiliary information is modulated by a signal represented by a combination of a sequence of pseudo-random numbers and a predetermined periodic signal, and the reflectance of an information recording surface of said optical disc is locally changed depending on the modulated sequence of data, thereby recording said auxiliary information on said optical disc.

28. An optical disc reproducing apparatus for detecting a returning beam produced from an optical disc when an optical beam is applied to the optical disc, and processing a reproduced signal having a signal level

changed in accordance with said returning beam to reproduce a sequence of data recorded on said optical disc, comprising:

a clock reproducing unit for reproducing a clock signal based on said reproduced signal;

a first reproducing unit for identifying said reproduced signal for binary levels based on said clock signal thereby to reproduce a sequence of data representing main information recorded on said optical disc; and

a second reproducing unit for processing a portion of said reproduced signal which corresponds to a change in recorded traces of pits or marks on said optical disc based on said clock signal thereby to reproduce a sequence of data representing auxiliary information recorded on said optical disc;

said second reproducing unit comprising:

a signal level detecting unit for outputting a detected signal level of said reproduced signal;

a pseudo-random number generating unit for generating a pseudo-random number;

a periodic signal generating unit for generating a predetermined periodic signal;

a selecting unit for changing and selecting

the polarity of said signal level from said pseudo-random number from said pseudo-random number generating unit and said predetermined periodic signal from said periodic signal generating unit;

an averaging unit for detecting and outputting an average value of selected results from said selecting unit; and

a unit for identifying an average value of detected signal levels from said signal level detecting unit to reproduce the sequence of data representing said auxiliary information.

29. The optical disc reproducing apparatus according to claim 28, wherein said periodic signal generating unit comprises a counter.

30. The optical disc reproducing apparatus according to claim 28, wherein said pseudo-random number generating unit comprises a linear feedback shift register.

31. The optical disc reproducing apparatus according to claim 28, wherein said selecting unit comprises a unit for selecting and outputting the detected signal level from said signal level detecting unit or a signal representing an inversion of said detected signal level, depending on a signal representing

a combination of said pseudo-random number from said pseudo-random number generating unit and said predetermined periodic signal from said periodic signal generating unit.

32. The optical disc reproducing apparatus according to claim 28, wherein said averaging unit comprises:

an integrating unit for integrating the selected results from said selecting unit and outputting an integrated value;

a counting unit for counting the number of times that the selected results from said selecting unit are integrated and outputting a count value; and

a dividing unit for dividing the integrated value by said count value and outputting the average value.

33. The optical disc reproducing apparatus according to claim 28, wherein said first reproducing unit stops reproducing the sequence of data representing said main information based on the sequence of data representing said auxiliary information.

34. The optical disc reproducing apparatus according to claim 28, wherein said first reproducing unit decrypts the encrypted sequence of data representing said main information based on the sequence of data

representing said auxiliary information.

35. A method of reproducing an optical disc by detecting a returning beam produced from an optical disc when an optical beam is applied to the optical disc, and processing a reproduced signal having a signal level changed in accordance with said returning beam to reproduce a sequence of data recorded on said optical disc, said method comprising the steps of:

a) reproducing a clock signal based on said reproduced signal;

b) identifying said reproduced signal for binary levels based on said clock signal thereby to reproduce a sequence of data representing main information recorded on said optical disc; and

c) processing a portion of said reproduced signal which corresponds to a change in recorded traces of pits or marks on said optical disc based on said clock signal thereby to reproduce a sequence of data representing auxiliary information recorded on said optical disc;

said step c) comprising the steps of:

d) outputting a detected signal level of said reproduced signal;

e) changing and selecting the polarity of said signal level from a pseudo-random number and a

predetermined periodic signal;

f) detecting and outputting an average value of selected results from said step e); and

g) identifying an average value of detected signal levels from said step d) to reproduce the sequence of data representing said auxiliary information.